then complete, for the proposal was adopted by twenty-one votes, without one dissentient voice.

Such is the work of the Congress.

This work is considerable. Its importance, however, is derived much more from the principles enunciated by the Congress than from the solutions it adopted.

The establishment of a single meridian and of a universal day, the unification of the astronomical and civil days, the extension of the decimal system,—these are reforms which the progress of science and of international relations rendered opportune and desirable.

In the application, however, of the principles, the Congress has been less successful.

In the choice of a primary meridian it allowed itself to be too much carried away by the practical and immediate advantages of a meridian already in very extended use, and disregarded the conditions which would have assured to its work a universal and definitive adoption.

In regard to ourselves we have in this question adhered to the part prescribed to us by our past, our traditions, and the very character of our national genius. Our proposal was precisely that which we should have adopted ourselves if we had had to take the initiation of this reform. The nation which created the metrical system could propose none other than it did. If our purely scientific and disinterested opinion did not unite the majority around it, the reverse was not for France, but for science. But science is the sovereign of modern times and one cannot now detach himself from it with impunity. It is vain to say that the meridian of Greenwich is *de facto* the universal meridian, that it reigns to-day over almost all the navies of the globe, and that its adoption only consecrates a fact which has already established itself and transforms into law the institutions of fact.

I reply that that is all true. I even add, if it is desired, that such is only what is merited by the great labours of the English marine—labours which we, the initiators of hydrography, more than any others appreciate at their true value. But however considerable may be these labours and however great the numbers of those availing themselves of them, yet with the experience of the past and in the name of history I say that these merits will not be able to prevent the inevitable consequences resulting from the personal character of this meridian. And in point of fact, has not France—she, too—had a great geographical career? The meridian of the Island of Ferro, which soon, in the hands of Gillaume Delisle and of our great geographers of the eighteenth century, became French—did it not bear sway in cartography for more than two centuries, and that with an authority not even equalled to-day by that on the other side of the Channel?

And yet the meridian of the Isle of Ferro, after that brilliant career, is to-day more and more abandoned, and the fair attempt of the seventeenth century finds itself entirely compromised!

What is the cause, then, which has led to this vexatious result? Apparently a mere trifle. It is because, as we have already said, instead of leaving the meridian of the Isle of Ferro in conformity with its first intention, instead of maintaining it in the purely scientific character which it received from the hands of Richelieu, that great spirit who so well understood that an institution of a universal order must bear no personal investiture, this character was imprudently changed by bringing the position of this meridian into relation with that of Paris, in place of bringing the position of this capital, like any other point, into relation with it.

That is the mistake which compromised the fortune of this reform so firmly and so judiciously established by its illustrious author. Now, this mistake, is it not committed to-day by once more taking a national meridian and making it the universal point of departure for longitudes? Is one not then justified in foreseeing that the same causes would produce the same effects, with this difference, nevertheless, that in the advanced state of civilisation prevailing to-day among the nations, a particular supremacy, of whatever nature, would be much more promptly abandoned than it was two centuries ago?

It is, accordingly, much to be feared that the establishment of the new meridian, if it even succeed in getting established, would again be but an attempt without a future.

France who finds in the history even of her own past the double lesson of the progressive abandonment of her national meridian and of the ever growing appreciation of the scientific and impersonal system of weights and measures, ought to make known to the Congress a counsel dictated by her own experience.

Does this attitude, however, sufficiently absolve us? Have we discharged towards the world and towards ourselves the debt due by a generous and enlightened nation which has always been delighted to take the initiative in tasks conducive to the general well-being? I do not think so; and, were it allowed me to express a wish, it would be that we should on this occasion again join example to precept. I should like that the France of the nineteenth century, considering herself the heir of the France of the seventeenth, would, with the benefit of the experience she has in that interval acquired, resume the fair attempt of Richelieu and herself establish the neutral meridian.

This institution, well conceived and planted on exclusively scientific bases, would gradually rally to it the adhesion of all. England herself, who, if possessing a lively national sentiment, has likewise an appreciation of what is just and great, would end by attaching herself to it. and then would this reform so long desired, always attempted in vain, and again quite recently compromised, be finally secured to the world and to science.

Be that as it may, and outside the question of the meridian, which is not yet settled, let us not forget that the accession of England to the Metrical Convention and the resolution for the extension of the decimal system are results demonstrating that our presence at Washington was not useless either to science or to progress.

THE VOYAGE OF THE "CHALLENGER"[1]

I.

NINE years have slipped away since the memorable expedition of the *Challenger* came to a close. During this interval from various published accounts of the voyage, the route around the world, the places called at, the life on board, the impressions, social or biological, left on the minds of the voyagers—are all now more or less familiar to us. There have likewise appeared numerous detailed quarto reports from different experts, into whose hands the great natural history collections amassed during the expedition were placed for description. We know precisely the additions made by the naturalists of the *Challenger* and their collaborateurs to our knowledge of the foraminifers, corals, medusæ, ostracods, brachiopods, echinoids, shore fishes, birds, and many other groups, and from the list of memoirs yet to come we can see how ample a store of detail is still to be produced. We know also how vast an amount of additional information has been gathered by the expedition regarding the physics and chemistry of the ocean. But as yet there has been no condensed official record of it all. The general public, and even the man of science, cannot be expected to master the series of special reports; life is too short for this, even if the power of comprehension were adequate. Admirable and exhaustive as the reports are, and indispensable for experts in the various branches of which they treat, each of these must necessarily appeal to a comparatively small circle of readers. What has been needed is such an official summary of the whole work of the expedition as will convey to the general public a sufficiently clear and detailed account of the whole results of the voyage of the *Challenger*, and will enable the man of science to realise what has been done in other departments than his own special domain.

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[1] "Report on the Scientific Results of the Voyage of H.M.S. *Challenger* during the years 1873-76." Prepared under the direction of the late Sir C. Wyville Thomson, and now of John Murray. "Narrative," vol. I., 1885

Such a summary has now been prepared and published as the "Narrative of the Cruise." It is called a volume, though in reality it consists of two stout quartos, comprising altogether upwards of 1100 pages. The first thought that will naturally occur to any intelligent person who takes an interest in these subjects, and who hears that at last the official narrative of the *Challenger* expedition is issued, will be that this at least is a part of the publications that he would like to possess, or at least would expect to find readily accessible as an authoritative and convenient record of what the expedition has done. His zeal for the acquisition of knowledge, however, may not improbably be damped when he learns that the book will cost him *6l. 16s. 6d.* Why such a prohibitory price should have been affixed to this work is one of those mysteries of Government publication which it is hopeless to understand or explain. There can be no question that this Narrative volume is the one of the whole series most likely to sell. There are, no doubt, hundreds of institutions and private individuals that would gladly purchase it if the cost were within their means, but to whom the acquisition of the whole series of Reports, or even a small proportion of them, is impossible. The official rule has been, we believe, to print off only 750 copies of each Report, to charge the whole cost of production upon that number, and then to destroy the copper plates and lithographic stones, so that on the supposition that the whole edition is sold, no loss

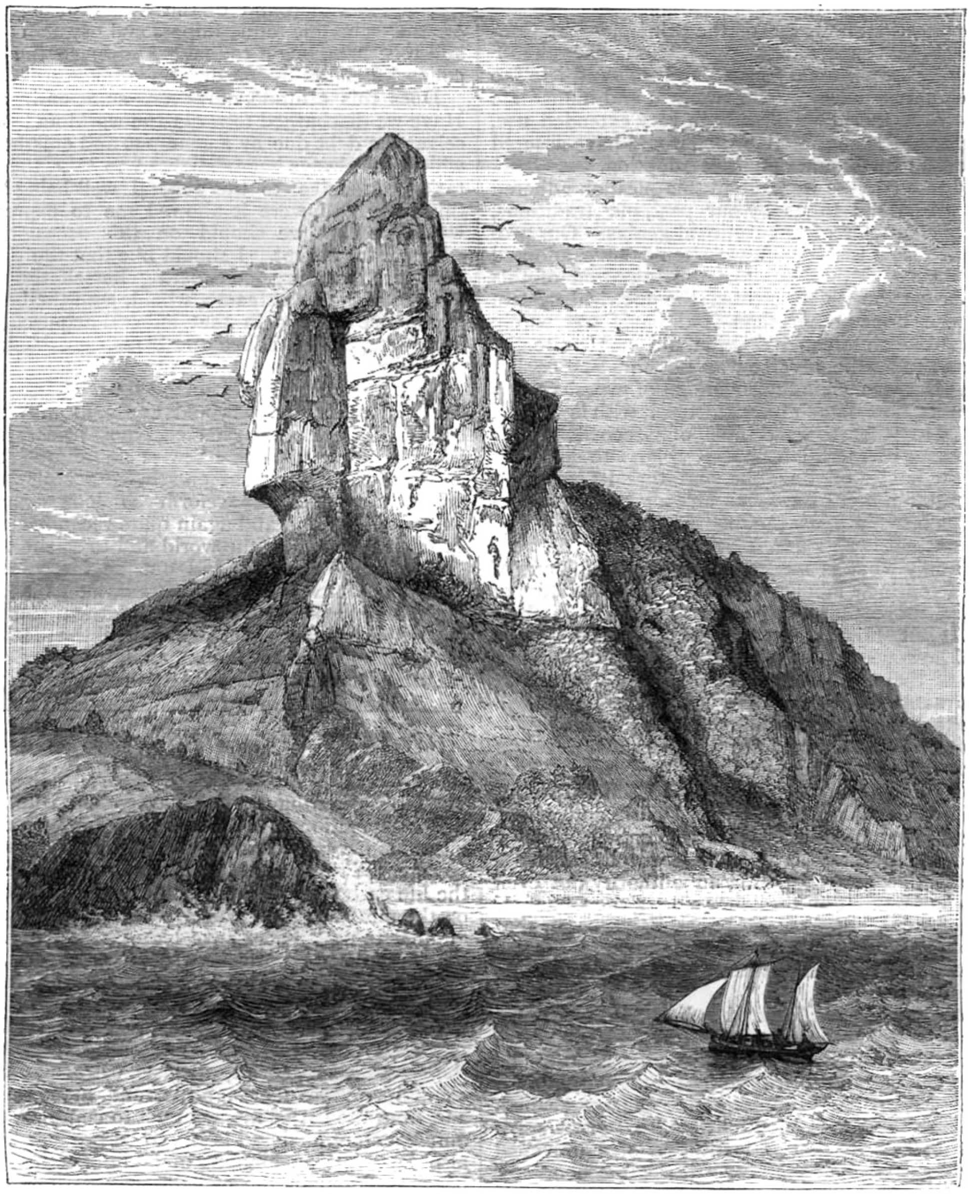

FIG. 1.—The Peak of Fernando Noronha, sketched from the Deck of H.M.S. *Challenger*, September 3, 1873.

from its publication will be incurred by the national exchequer. This may or may not be a judicious rule for the reports of specialists for which no great sale can be expected; but surely it is not a wise one in the case of the Narrative volume, for which a much wider circulation may confidently be expected. It is understood that the type and plates of this volume are kept up, so that if the present edition is sold off another may be printed. But as the cost of production has been charged upon the first edition, every copy subsequently produced will cost nothing but the mere paper, printing, and binding. Government cannot, of course, wish to make profit out of the book as a commercial speculation. Would it not have been more in accordance with common sense and trade economy to have issued a much larger edition at first, and to have spread the cost of production over the whole of it? Had the book been sold at half its present price its sale would probably have been more than doubled. That, even as it is, the whole edition will be sold we confidently believe. But that will be no justification whatever for making the price so high. After so large a sum of money has been spent upon the expedition first and last, it seems perfectly childish to publish the results in such a form that even the most generally useful and intelligible part of them are out of the reach of most of those who really feel an interest in them.

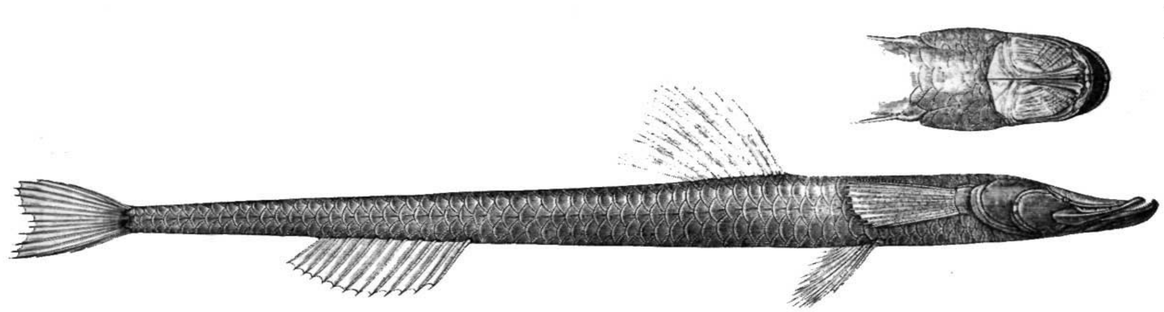

Fig. 2.—*Ipnops Murrayi*, Günth., 1600 to 1900 fathoms.

There is another question which my Lords of the Treasury will have to face in regard to this Narrative volume. Many requests have been made to that pachydermatous body for gifts of different reports; many more would no doubt have been made but for the known determination on the part of the authorities to refuse them. Now, it is tolerably certain that public libraries all over the country will ask for at least copies of the "Narrative of the Cruise," and the whole of the first edition would probably barely suffice to supply their demand. That their requests will be again refused goes without saying. But it will be noteworthy if these public institutions are content with the refusal. The country has a right to insist that the results of an expedition on which so much public money has been spent shall be made as widely accessible as possible, and will no doubt brush roughly aside the stereotyped official objections. A more flagrant case of the stupidity into which a blind adhesion to red-tape rule may lead a Department that no doubt means well could hardly be found than this Narrative volume and its price of 6*l.* 16*s.* 6*d.*

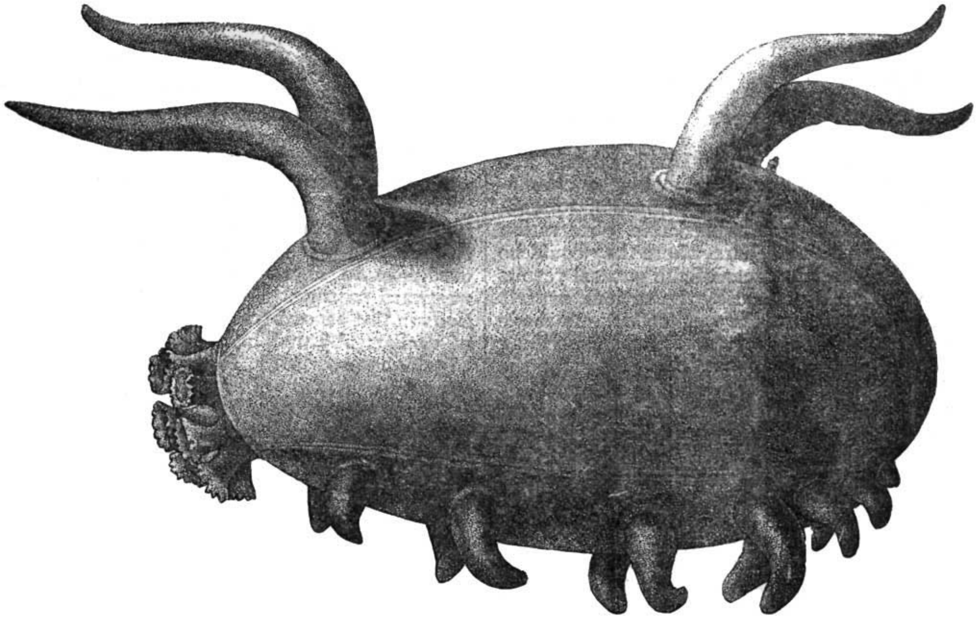

Fig. 3.—*Scotoplanes globosa*, Théel.

With this preliminary protest we gladly pass on to notice the book itself. First of all, like the previously published Reports, the "Narrative" is admirably got up. The paper, print, illustrations, and binding are so vastly superior to ordinary Stationary Office productions that we wonder more than ever how the Treasury officials were ever prevailed upon to sanction such expenditure, even though with the prospect of charging a high price. The book is in two parts, each of which forms a thick, heavy quarto of more than 500 pages. It contains 14 chromo-lithographic plates, giving illustrations of deep-sea deposits, Antarctic icebergs, and various aborigines and their handiwork; 35 photographic plates, among which the glaciated pavement at Halifax, the lava-cascade at Kilauea, and some of the representations of growing vegetation are particularly good; 43 charts of the route of the voyage and of stations visited, including a large and valuable physical chart of the world on which all the newest information as to ocean depths is given, together with the track of the *Challenger* and the nature of the bottom observed in the different soundings; 22 diagrams showing the vertical distribution of temperature in the ocean, and embodying in a graphic and intelligible form a vast amount of detail regarding this fascinating subject; 340 woodcuts, including many illustrations of the more novel or interesting natural history "finds" of the voyage, and some of them remarkable for the exquisite beauty and fidelity with which they have been executed; and, lastly, which will surprise the reader accustomed only to the prosaic solidity of Government publications, there are tail-pieces to the several chapters—mermaids filling the tow-net for the naturalists above, scenes from the life of the cruise on deck and on shore, and little bits of fancy that remind one sometimes of Edward Forbes.

The general scope of this "narrative" was sketched out by Sir Wyville Thomson, and in his preface to the first volume of the "Zoological Reports" he referred to it as actually in progress. He died, however, before he had made any progress with it, the world losing in him the enthusiastic and kindly spirit that planned the whole expedition, saw it successfully completed, and organized the systematic working out of its collections. Since his lamented death the work has been vigorously prosecuted by his successor in the editorial supervision of the Reports, Mr. John Murray, who, in conjunction with Staff Commander Tizard, Professor Moseley, and Mr. J. Y. Buchanan, and with the co-operation of the various specialists employed, has compiled this voluminous "Narrative of the Cruise."

The general plan of the work may be briefly stated. The leading idea of the writers has been to give a chronological account of the voyage from beginning to end, recording at each station any remarkable observation there made, inserting here and there, where they could be most appropriately given, abstracts of the general results arrived at up to the present time by the various experts to whom different portions of the vast collections made during the cruise have been entrusted, and describing fully the various equipments of the *Challenger* for the scientific work for which the expedition was designed.

Some of these features of the book have, of course, already become more or less familiar from the publications of Sir Wyville Thomson himself, and of Professor Moseley, Lord George Campbell, Mr. Wild, and others. But they have never been presented so fully nor illustrated so amply. Unfortunately all the scientific work connected with the expedition is not yet completed, so that it was not possible to give in the "Narrative" a summary of the whole results achieved. But as far as the work had advanced up to the time of its publication, the volume now issued contains a digest of it, prepared by the various specialists by whom it has been accomplished. When the whole *Challenger* results have been published, we hope that in a future edition of the "Narrative," a conspectus of the entire work of the expedition may be completely given.

The introductory chapter presents an outline of the history of research in the ocean. This is followed by a detailed account of the fittings of H.M.S. *Challenger*, which will be useful as a record of the state of deep-sea investigation in 1872. The proper narrative then begins with the departure from Portsmouth, the various trials of the apparatus and training of the crew in the kind of work which was to be prosecuted during the cruise, and a full description of the instruments employed and the methods of observation with them. This, though to most readers rather a dry subject, is here treated with a fulness not elsewhere to be found. The account of the thermometrical observation and of Professor Tait's subsequent researches, with the actual instruments employed, is a valuable part of the book. Listening to these detailed descriptions of what they were trying to do and how they attempted to do it, we are hardly aware that we have been carried through more than a hundred closely printed pages, and from the shores of Old England to the Peak of Teneriffe. But the real work of the expedition was now to begin with the running of a section across the North Atlantic. A good deal of information from previous observation was already in existence regarding the depths and form of the bottom of this ocean. But no such series of soundings had ever been made across it as was now to be carried out by the *Challenger*. Twenty-four soundings, fifteen dredgings, two trawlings, and thirteen serial temperature soundings, were taken between Teneriffe and the West Indies. A brief description of the more interesting features of these researches is given, and then, as we are carried onward to Bermuda and as the various treasures of the deep are brought before us, some species of brachiopods hauled up from the bottom afford an opportunity of hearing Mr. Thomas Davidson discourse regarding his examination of the whole of the brachiopoda collected during the cruise. At Bermuda we hear again of the wonderful Æolian rocks, which from the early descriptions of Captain Nelson down to those of Sir Wyville Thomson have attracted the notice of geologists. Running up to Halifax, Nova Scotia, we catch a glimpse of the wonderfully glaciated rocks of that region, and on the return voyage to Bermuda we watch the officers of the Expedition gauging the temperature and depth of the Gulf Stream, and bringing up an Arctic fauna from depths of 1250 to 1700 fathoms. Among the novelties taken are a curious ascidian, which gives occasion for a short discourse from Professor Herdman regarding the tunicata discovered and brought home by the *Challenger*.

In this pleasant and instructive way we are led on from station to station, noting clearly and vividly what the ship passed through and what its scientific staff were engaged in. From Bermuda we are once more borne across the Atlantic and take part in another series of soundings and dredgings to check or confirm those obtained in the westward passage. Among the more interesting observations in this second traverse were those on the occurrence of various abysmal brittle stars, some from a depth of 2850 fathoms, and Mr. Theodore Lyman, into whose hands the whole of the ophiurans collected during the cruise were placed, gives us a *résumé* of his study of them. After some time spent in observations among the Azores and Cape Verde Islands, we are carried southwards to St. Paul's Rocks, of which an interesting account was, long ago, given by Darwin, and to which attention has recently been called by the Abbé Rénard, whose investigation of the microscopic structure of the rock has already appeared in the Reports of the *Challenger* expedition. We catch a tantalising glimpse of Fernando Noronha, regarding which little new information can be obtained, since the Governor refuses permission to make collections. So, casting a wistful look at its colossal peak (Fig. 1) we are transported to the coast of Brazil, and thence back again into the centre of the South Atlantic where the lonely rocks of Tristan da Cunha rise above the waves. This section of the voyage is full of interest. The naturalists are evidently getting more practised in their duties, the crew more expert in the labours of sounding, trawling, and dredging, and the hauls are more generally successful than in the earlier weeks of the cruise. The dredgings and trawlings along the American coast are specially important, bringing to light many new forms belonging to nearly all the invertebrate groups, and the first specimens of a new genus of nearly blind fish (*Bathypterois*). A *résumé* of all that has been added to our knowledge of the radiolaria is here inserted, with some excellent woodcuts which bring the structures of these beautiful organisms clearly before the eyes. On the way to Tristan da Cunha another new genus of fish (*Ipnops*, Fig. 2) is brought up having a quite unique structure of eye which appears to be designed for detecting the presence of very small quantities of light at great depths, at the expense of all apparatus for forming an image. From Tristan da Cunha, of which an interesting description is given with good illustrations, the section of the South Atlantic is continued to the Cape of Good Hope. The tow-nets did not yield such a rich assemblage of life as in the more tropical parts of the ocean, but the account of this section is enlivened by a summary from Dr. Hjalmar Théel of Upsala, giving the results of his examination of the holothurioidea collected during the whole cruise. One of the curious new forms described by him is shown in Fig. 3. From the Cape of Good Hope the *Challenger* strikes away south-eastward into the Antarctic regions, but a notice of the further progress of the cruise must be reserved till next week.

(*To be continued.*)

NOTES

THE death is announced at Lund, Sweden, of the distinguished physicist, Prof. A. W. Eklund, at the age of ninety years.

WE learn from *Science* that at the meeting of the American Association at Ann Arbor on August 26, the University will furnish electricity, either from a dynamo, from a storage-battery, or from primary batteries, as may be needed by members reading papers on electrical subjects. An evening reception on a day not specified will be given the association at the court-house, together with a lawn-party on the University grounds at the close of one of the regular sessions. The Excursions Committee has nearly completed arrangements for a trip, free of all expense, to the Saginaw Valley, including a steamboat run down the river, and view of the cities of Saginaw, East Saginaw, Bay City, and West Bay City, and the enormous industries in salt and lumber manufacture which have given the Saginaw Valley a world-wide celebrity. This valley produces annually a billion feet of lumber, and the excursionists will see half a billion piled on the docks. In conjunction with these vast lumber operations will be seen the production of salt on a scale unequalled in the world, and employing the various improved processes. The Committee has also arranged for excursions to Detroit and Mackinack Island, with side trips to Salt Marie, Pectoskey, and Marquette. Those wishing to make any special inquiries or arrangements should address Prof. J. W. Langley, local secretary, Ann Arbor.

A BARONETCY has been conferred upon Mr. Isaac Lowthian Bell.

THE Indian Government has sent a geological surveyor to report on the scientific aspects of the Cashmere earthquake of May 13. Further shocks are reported with renewed violence on June 24 and 25. A correspondent of a Calcutta journal, writing on the second day after the first great shock, says that the force of the earthquake appeared to have concentrated itself at certain spots, and there to have spent itself. These spots look as though a large amount of gaseous matter under the earth had, with the strength of dynamite, been struggling for an outlet, and had torn and lacerated the ground at the point where it found an exit. Thus villages are seen with the huts all destroyed, the earth adjacent being cracked and split, and the air putrescent from the bodies of cattle buried under the houses, while not twenty yards distant a sloping, wooded hill seems untouched. In other places the side of a vertically-scarped hill has been sliced off as if by the guillotine, the earth so severed lying at the base. Some hill-sides are only partially disconnected, and a deep incision remains. Other hills present the appearance of an ordinary landslip. Near the village of Lalledourah three enormous chasms have been formed, one about three-quarters of a mile broad and 20 feet deep. Not far distant a tract of land 800 yards square has subsided, forming a trench 100 yards long, 50 feet deep, and 30 feet wide. The latest returns regarding the damage give the loss of life at 3081 persons, besides 25,000 sheep and goats and 8000 cattle. The number of dwellings destroyed is estimated at 75,000.

A VIOLENT shock of earthquake was felt at Douai, Dognies, and Flers-en-Escrebieux on Wednesday, June 22. The phenomenon was preceded by a rumbling sound, which is described as having resembled the distant report of a cannon. It occurred at ten minutes past four in the morning, when most of the inhabitants were still in bed. Many of them were awoke by the shock, and were so alarmed that they rushed in their night-clothes out of their houses into the streets and roads. The oscillation of the ground stopped a great many of the clocks. No very serious damage was done.

THE New York correspondent of the *Standard* telegraphs that the receipts from Prof. Tyndall's lectures in the States in the year 1872 now amount to a fund of 32,400 dollars. The Professor desired that the money should be devoted to the sustentation of science fellowships; but a difficulty arose in satisfying the conditions of the deed of gift, and meanwhile the money has accumulated. Acting, however, upon a suggestion from the trustees of the fund, Prof. Tyndall has now directed that the money shall be equally divided between the Universities of Columbia, Harvard, and Pennsylvania.

THE ninth anniversary meeting of the Sanitary Institute of Great Britain will be held, by the kind permission of the Board of Managers of the Royal Institution, in their Lecture Theatre, Albemarle Street, on Thursday, July 9, at 3 p.m. The chair will be taken by Sir John Lubbock, Bart., M.P., D.C.L., F.R.S. An address will be delivered by Prof. W. H. Corfield, M.A., M.D., entitled "The Water Supply of Ancient Roman Cities," and the medals and certificates awarded to the successful exhibitors at the Exhibition held at Dublin, in 1884, will be presented.

THE Organising Committee of the General Meeting of the Italian Meteorological Society, which meets in Florence from September 8 to 14, was held on May 15, under the Presidency of Prince Corsini, who was elected President of the General Meeting, the Vice-Presidents being Profs. Cecchi and Neucci, and the Secretary, Sig. Giovannetti; the Committee then divided into two Sections, one for scientific purposes, the other for practical and executive purposes.

THE Norwegian Government have contributed a sum of about 200*l.* for the prosecution of various researches during the summer, amongst which may be mentioned the zoological studies of Prof. R. Collett in East Finmarken; the entomological, malacological, and hydrographical studies of Dr. Schneider in the province of Tromsö; the researches of Dr. Johannsen on the appearance of struma in the vicinity of the lake Mjósen; and the algological studies of Herr Foslie on the south coast of Norway. A sum of 350*l.* has also been granted to the Society of Science at Christiania, as well as the usual annual grant to Dr. Sophus Tromholt for the prosecution of his studies of the aurora borealis.